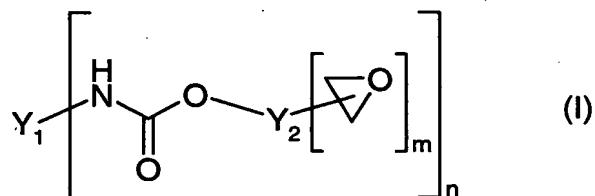


Patent claims

1. A composition comprising
at least one epoxide adduct **A** having on average more than one
5 epoxide group per molecule;

at least one polymer **B** of the formula (I)



in which

10 Y_1 is an n-valent radical of a linear or branched polyurethane prepolymer terminated with isocyanate groups after removal of the terminal isocyanate groups;

15 Y_2 is a radical of an aliphatic, cycloaliphatic, aromatic or araliphatic epoxide containing a primary or secondary hydroxyl group after removal of the hydroxide and epoxide groups;

n is 2, 3 or 4;

20 m is 1, 2 or 3;

and has at least one aromatic structural element which is bound in the polymer chain via urethane groups;

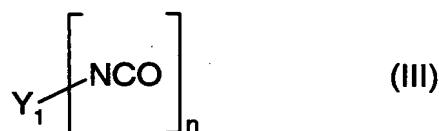
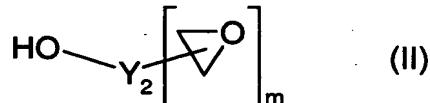
25 at least one thixotropic agent **C** based on a urea derivative in a nondiffusing carrier material;

and

30 at least one curing agent **D** for epoxy resins which is activated by elevated temperature.

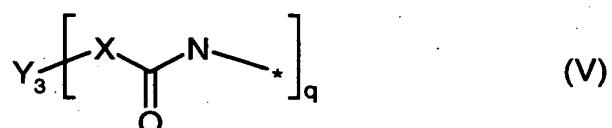
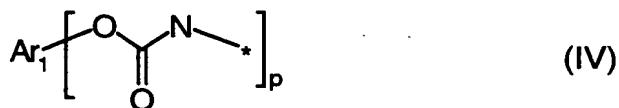
2. The composition as claimed in claim 1, characterized in that the epoxide adduct **A** is obtainable from the reaction
of at least one dicarboxylic acid and at least one diglycidyl ether;
5 or
of at least one bis(aminophenyl) sulfone isomer or of at least one aromatic alcohol and at least one diglycidyl ether.
- 10 3. The composition as claimed in claim 2, characterized in that the dicarboxylic acid is a dimeric fatty acid, in particular at least one dimeric C₄-C₂₀ fatty acid, and the diglycidyl ether is bisphenol A diglycidyl ether, bisphenol F diglycidyl ether or bisphenol A/F diglycidyl ether.
- 15 4. The composition as claimed in claim 2 or 3, characterized in that the aromatic alcohol is selected from the group consisting of 2,2-bis(4-hydroxyphenyl)propane, bis(4-hydroxyphenyl)methane, bis(4-hydroxyphenyl) sulfone (= bisphenol S), hydroquinone, resorcinol, pyrocatechol, naphthohydroquinone, naphthoresorcinol, dihydroxynaphthalene, dihydroxyanthraquinone, dihydroxybiphenyl, 3,3-bis(p-hydroxyphenyl)phthalides, 5,5-bis(4-hydroxyphenyl)hexahydro-4,7-methanoindane, 4,4'-[bis(hydroxyphenyl)-1,3-phenylenebis(1-methylethylidene)] (= bisphenol M), 4,4'-[bis(hydroxyphenyl)-1,4-phenylenebis(1-methylethylidene)] (= bisphenol P) and all isomers of the abovementioned compounds, and the diglycidyl ether is bisphenol A diglycidyl ether, bisphenol F diglycidyl ether or bisphenol A/F diglycidyl ether.
- 20 5. The composition as claimed in any of the preceding claims, characterized in that the polymer **B** is soluble or dispersible in epoxy resins.
- 25 6. The composition as claimed in any of the preceding claims, characterized in that the polymer **B** is obtainable from the reaction of a monohydroxyepoxide of the formula (II) and of a linear or branched polyurethane prepolymer terminated with isocyanate groups and of the formula (III)

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7. The composition as claimed in claim 6, characterized in that, in the process for the preparation of the polyurethane prepolymer of the formula (III), at least one polyisocyanate, at least one, optionally substituted, polyphenol and at least one isocyanate-reactive polymer are used.
8. The composition as claimed in claim 7, characterized in that the isocyanate-reactive polymer of the formula (III) is a polyol selected from the group consisting of the polyoxyalkylenepolyols, polyhydroxy-terminated polybutadienepolyols, styrene/acrylonitrile-grafted polyetherpolyols, polyhydroxy-terminated acrylonitrile/butadiene copolymers, polyesterpolyols and polycarbonatepolyols.
9. The composition as claimed in claim 7 or 8, characterized in that the isocyanate-reactive polymer of the formula (III) is an α,ω -polyalkylene glycol having C₂-C₆-alkylene groups or having mixed C₂-C₆-alkylene groups, in particular a polypropylene glycol or a polybutylene glycol.
10. The composition as claimed in any of claims 7-9, characterized in that the isocyanate-reactive polymer of the formula (III) has an equivalent weight of 600 - 6000 g/equivalent of NCO-reactive groups, in particular of 700 - 2200 g/equivalent of NCO-reactive group.
11. The composition as claimed in any of claims 7-9, characterized in that the polyisocyanate of the formula (III) is a diisocyanate, preferably HDI, IPDI, TMDI, MDI or TDI.

12. The composition as claimed in any of the preceding claims, characterized in that the polymer chain of the polymer **B** simultaneously has the structural elements of the formulae (IV) and (V)



5 in which

p is 2, 3 or 4, in particular p is 2 or 3;

q is 2, 3 or 4, in particular q is 2 or 3;

X is S, O or NH; in particular X is O;

Ar₁ is a p-valent, optionally substituted, aryl radical;

10 Y₃ is a q-valent radical of an isocyanate-reactive polymer after removal of the terminal amino, thiol or hydroxyl groups and

* is the linkage point to the remainder of the polymer chain.

- 15 13. The composition as claimed in any of the preceding claims, characterized in that the proportion by weight of all polymers **B** of the formula (I) is from 5 to 40% by weight, preferably from 7 to 30% by weight, based on the weight of the total composition.

20 14. The composition as claimed in any of the preceding claims, characterized in that the carrier material of the thixotropic agent **C** is a blocked polyurethane prepolymer.

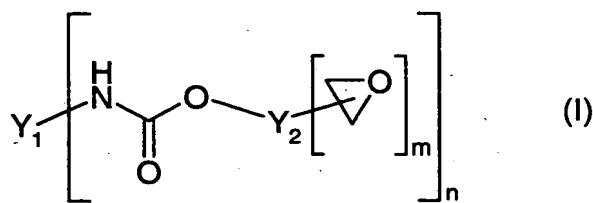
25 15. The composition as claimed in any of the preceding claims, characterized in that the urea derivative in the thixotropic agent **C** is a product of the reaction of an aromatic monomeric diisocyanate, in particular 4,4'-diphenylmethylenediiisocyanate, with an aliphatic amine compound, in particular butylamine.

30 16. The composition as claimed in any of the preceding claims, characterized in that the total proportion of the thixotropic agent **C** is 5 - 40% by weight, preferably 10 - 25% by weight, based on the

weight of the total composition.

17. The composition as claimed in any of the preceding claims, characterized in that the proportion of the urea derivative is 5 - 50% by weight, preferably 15 - 30% by weight, based on the weight of the thixotropic agent **C**.
18. The composition as claimed in any of the preceding claims, characterized in that the curing agent **D** is a latent curing agent selected from the group consisting of dicyandiamide, guanamines, guanidines and aminoguanidines.
19. The composition as claimed in any of the preceding claims, characterized in that the total proportion of the curing agent **D** is 1 - 10% by weight, preferably 2 - 8% by weight, based on the weight of the total composition.
20. The composition as claimed in any of the preceding claims, characterized in that at least one filler **E** is additionally present.
21. The composition as claimed in claim 20, characterized in that the total proportion of the filler **E** is 5 - 30% by weight, preferably 10 - 25% by weight, based on the weight of the total composition.
22. The composition as claimed in any of the preceding claims, characterized in that at least one reactive diluent **F** carrying epoxide groups is additionally present.
23. The composition as claimed in any of the preceding claims, characterized in that the composition, after curing, has a low-temperature fracture energy, measured according to DIN 11343, of more than 10 J at -20°C and of more than 7 J at -40°C and preferably of more than 11 J at -20°C and of more than 9 J at -40°C.
24. An impact strength modifier terminated with epoxide groups and of the formula (I)

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in which

Y₁ is an n-valent radical of a linear or branched polyurethane prepolymer terminated with isocyanate groups after removal of the terminal isocyanate groups;

5

Y₂ is a radical of an aliphatic, cycloaliphatic, aromatic or araliphatic epoxide containing a primary or secondary hydroxyl group after removal of the hydroxide and epoxide groups;

10

n is 2, 3 or 4;

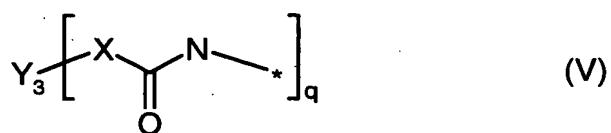
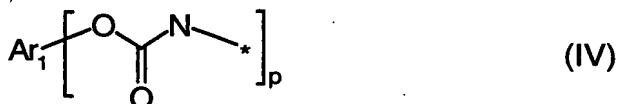
15

m is 1, 2 or 3;

and has at least one structural element which is bound in the polymer chain via urethane groups.

20

25. The impact strength modifier terminated with epoxide groups, as claimed in claim 24, characterized in that the polymer chain of the impact strength modifier simultaneously has structural elements of the formulae (IV) and (V)



in which

p is 2, 3 or 4, in particular p is 2 or 3;
25 q is 2, 3 or 4, in particular q is 2 or 3;

X is S, O or NH; in particular X is O;

Ar₁ is a p-valent, optionally substituted aryl radical;

Y₃ is a q-valent, optionally chain-extended, radical of an isocyanate-reactive polymer after removal of the terminal amino, thiol or hydroxyl groups and

5

* is the linkage point to the remainder of the polymer chain.

- 10 26. The impact strength modifier terminated with epoxide groups, as claimed in claim 24 or 25, characterized in that the impact strength modifier is obtainable from the reaction of a monohydroxyepoxide of the formula (II) with a linear or branched polyurethane prepolymer terminated with isocyanate groups and of the formula (III), and in that at least one polyisocyanate and at least one polyphenol and at least one isocyanate-reactive polymer are used in the preparation of this polyurethane prepolymer.
- 15 27. The use of a composition as claimed in any of claims 1 - 23 as a one-component adhesive.
- 20 28. The use of an impact strength modifier terminated with epoxide groups, as claimed in any of claims 24 - 26, in a two-component adhesive, characterized in that this impact strength modifier is a constituent of the first component and at least one polyamine or at least one polymercaptan is a constituent of the second component.
- 25 29. The use as claimed in claim 27 or 28, characterized in that the adhesive is used for the adhesive bonding of heat-stable materials, in particular of metals.
- 30 30. The use as claimed in any of claims 27 to 29, characterized in that the adhesive is used as a body-shell construction adhesive in automotive construction.
- 35 31. A method for the adhesive bonding of heat-stable materials, in particular of metals, characterized in that these materials are brought into contact with a composition as claimed in any of claims 1 - 23 and comprises a subsequent step of curing at a temperature of 100 - 220°C, preferably 120 - 200°C.